Cam Valley forum

The Cowpat Question

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Introduction

We have been asked whether the cattle on Grantchester Meadows and on Coe Fen (opposite Cambridge Canoe Club) could be a significant source of the faecal pollution of the Cam.

We have explored this, and our conclusion is that the cattle have no discernible impact on faecal pollution at Sheep's Green, or Newnham Riverbank club

Anglian Water have been monitoring levels of E.coli and Intestinal Enterococci bacteria, every week at the 16 sites we recommended, from September 2022-2023. The results are on our website[1]. These sites include Grantchester Cricket Pitch Field (at the upstream end of Grantchester Meadows) Newnham Riverbank Club (just downstream of the Meadows), Vicars Brook (flowing through Coe Fen, and into the Cam just upstream of Sheep's Green) and Sheep's Green (the proposed Designated Bathing Water site).

Popular bathing sites are shown with blue stars on the map above.

As the cattle are present during the summer, but are removed from the meadows in late autumn, the Anglian Water data allows us to compare the levels of faecal bacteria when the cattle are, and are not, present.

In 2022/23 the cattle were removed from Grantchester Meadows on 28 November 2022 (this was unusually late) with a new herd arriving on around 4 April 2023. They were removed from the Coe Fen opposite Cambridge Canoe Club (i.e. beside Vicar's Brook) in late October 2022, returning in early April 2023.

[1] https://camvalleyforum.uk/anglian-water-data/

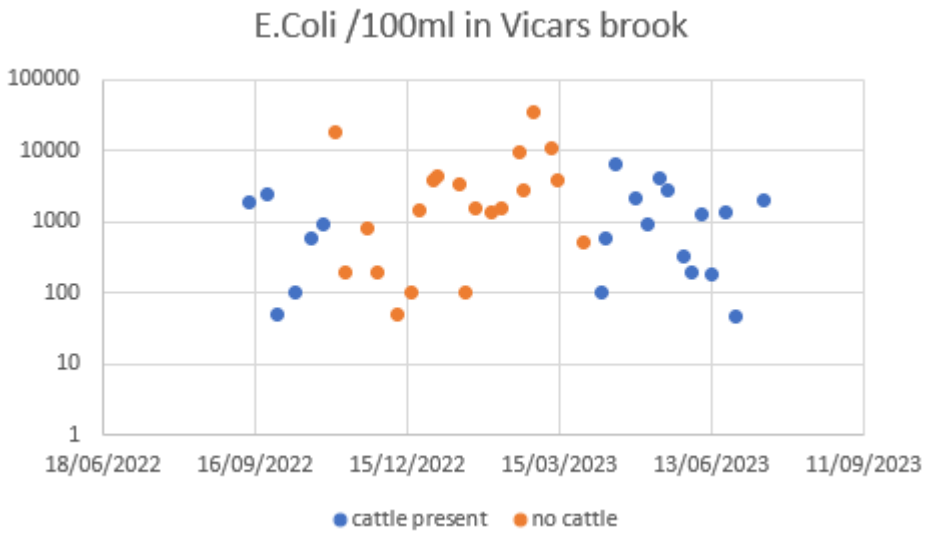
Vicar's Brook

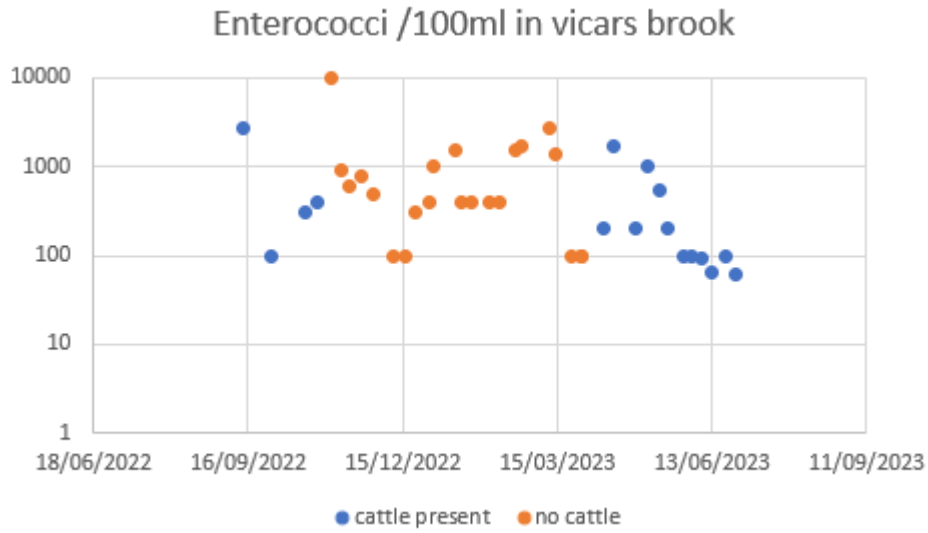
Cattle graze alongside Vicar's Brook which joins the Cam at the upstream end of the proposed Designated Bathing Water site at Sheep's Green. This means that monitoring the water quality of Vicar's Brook is good indicator of whether the cattle alongside it could be having an impact on the water quality at Sheep's Green.

The flow rate of Vicars Brook is usually low, so any pollution in Vicar's Brook is very much diluted by the much larger volume of water flowing down the Cam.

Reassuringly however, as the graphs below show, there is no discernible difference in pollution levels when the cattle are, and are not in the field beside Vicar's Brook.

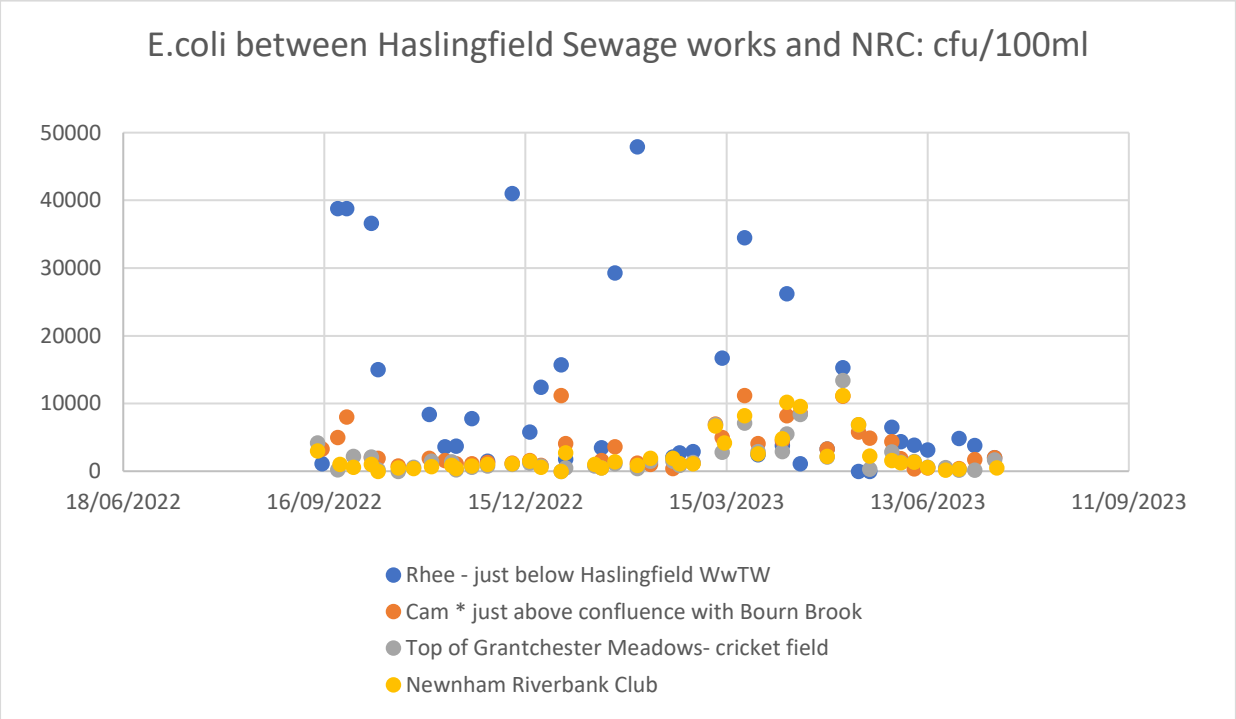
Note that E.coli levels of 1000 cfu/100ml or above are "considered elevated". It is normal for there to be quite a lot of variability between readings.

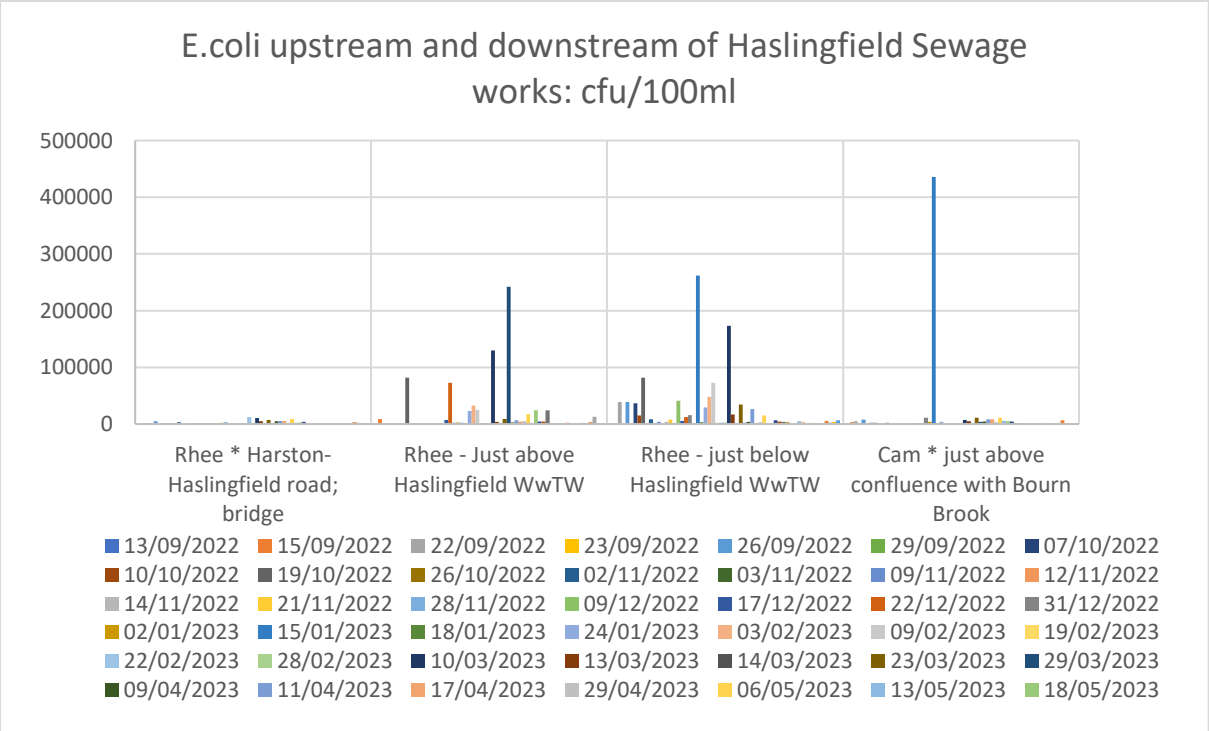




Grantchester Meadows

Faecal pollution levels on Grantchester Meadows varied a lot during the testing period, particularly at the upstream end. Between March and May 2023 the faecal pollution was often very high. We do not yet know the reasons, but the source appeared to be somewhere between the Harston-Haslingfield Road bridge and a point just downstream of Haslingfield sewage works. The discharge from the sewage works includes treated effluent that can contain high levels of faecal bacteria, and occasional overflows of untreated sewage. We will be investigating this further and hope to report our findings in due course.



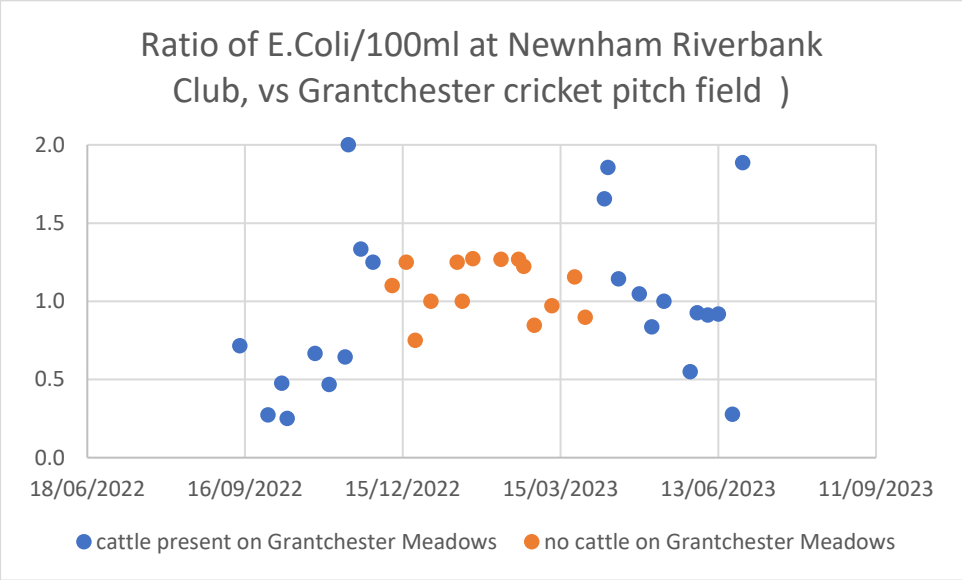


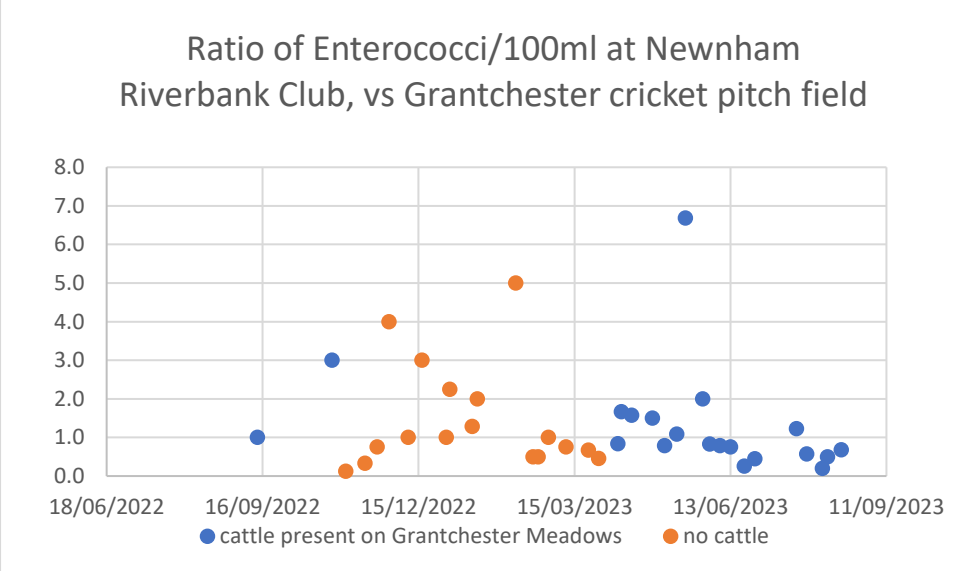
To consider the impact of the cattle, given this variability in the faecal pollution arriving at the upstream end of Grantchester Meadows, we decided to look at how the levels of faecal bacteria change between the upstream and downstream ends of the Meadows.

Does the water quality get better or worse as the river flows past the meadows, and is there a difference if the cattle are there?

Our conclusion is that there's little difference. In the peak summer months, despite the presence of the cattle, the river appears if anything to become cleaner as the river water flows past the Meadows, but there is a lot of variability. Sunlight is known to kill off bacteria, so this could be helping in the summer months.

The levels of enterococci are more variable, but in general there seems to be no change in the levels of enterococci as the water flows past the meadows. This maybe because Enterococci are known to be more persistent, so are less sensitive to sunlight.





Our conclusion is that the cattle on Grantchester Meadows make no discernible difference to faecal pollution downstream.

What's in a cowpat?

As cross check, we have done a rough estimate[2] of the theoretical impact of the E.coli in the cowpats from a typical Grantchester Meadows herd of around 20 cattle. Based on research by Bond *et al*[3] on the behaviour of a herd in Hampshire, and our own observations on Grantchester Meadows, we expect that most of the cowpats will be away from the river, and most will dry out before they wash into the river. We estimate that roughly around 0.1% of the cowpats from the herd might wash into the river. Given the typical concentration of E.Coli in cowpats, the herd would contribute just 3 E.coli/100ml to the river.

As the overall summer E.coli pollution in the river from other sources is typically at least 2500 E.coli/100ml, **this suggests a cowpat contribution of, at most, around 0.1% from the cattle on Grantchester Meadows.**

Conclusion

Analysis of the data from Anglian Water, and our own estimate of the maximum potential theoretical contribution from cowpats, suggests the cattle have no discernible impact on faecal pollution of the Cam at either Sheep's Green, or Newnham Riverbank club.

Our data suggests that Haslingfield Sewage Works and its surroundings are much more likely primary sources of the elevated levels of faecal pollution in the Cam at Sheep's Green.

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[2] This calculation assumes: a herd of 20 Cattle, each producing 15 x 1kg cowpats a day with 85% moisture, each cowpat containing 10 Million E.coli/ g dry weight, assuming that 0.1% of cowpats wash into the river, which is flowing at a typical summer flow rate of 350l/sec

[3] Temperature-driven river utilisation and preferential defecation by cattle in an English chalk stream, Bond et al https://www.sciencedirect.com/science/article/abs/pii/S1871141312000789